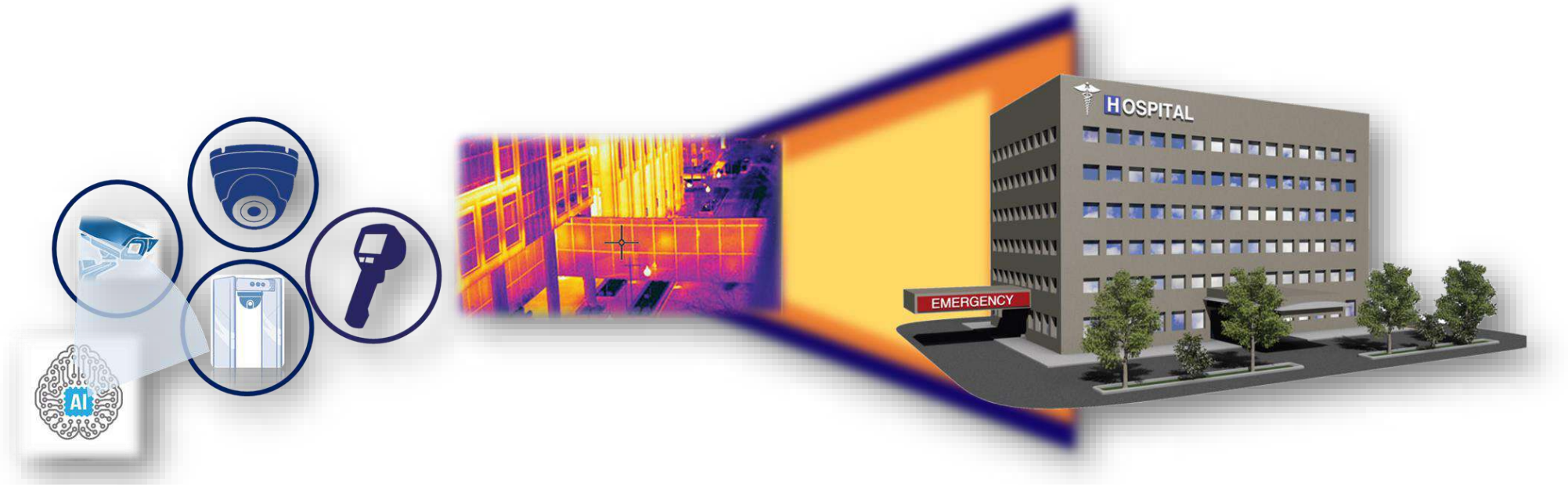
Use of Thermal technology & Artificial Intelligence to Fight against COVID-19



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CONSORTIUM OF ACCREDITED HEALTH CARE ORGANISATIONS
CAHO
Committed to Safer Patient Care

Presented by

PRAMA HIKVISION

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Content

- What is Thermal technology ?
- Thermal Technology in Surveillance Products
- How Thermal technology works in Surveillance Products?
- Thermal Temperature Screening with AI Technology
- Why we need Surveillance solution in Hospitals ?
- Application Scenarios of Surveillance Solution for Hospital & Its Benefits

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What is Thermal Technology ?

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What is Thermal technology ?

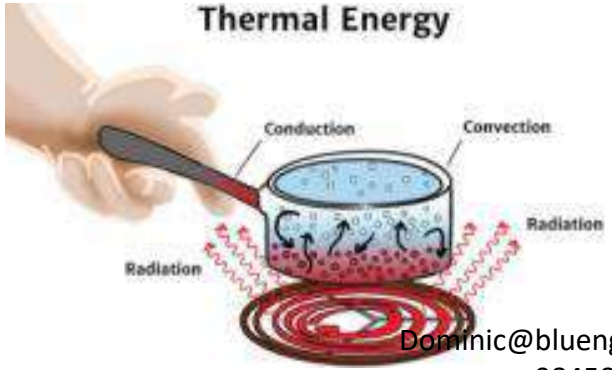
Thermal technology is the technology of producing, storing, controlling, transmitting, and getting work from heat energy (Thermal Energy).

Thermal energy has many practical applications, especially in everyday households: cooking, heating and cooling, and generating electricity all depend on energy transformations that end by transferring heat energy.

Thermal Imaging is an example of thermal technology. Other examples of machines used are: Turbines, boilers, refrigerators, air conditioners etc.

Heat (Thermal) energy is transferred in three ways:

solid material (**conduction**), liquids and gases (**convection**), and electromagnetical waves (**radiation**)



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Thermal Technology in "Surveillance Products"

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Thermal Technology in Surveillance Products

Thermal technology has many practical applications in the real world and it is a great addition to, and enhancement of traditional security solutions.

Thermal imaging is a method of using infrared radiation and thermal energy to gather information about objects, in order to formulate images of them, even in low visibility environments.

Thermal Imaging is a type of thermal technology Which used in Surveillance cameras and its widely known as Thermal Cameras

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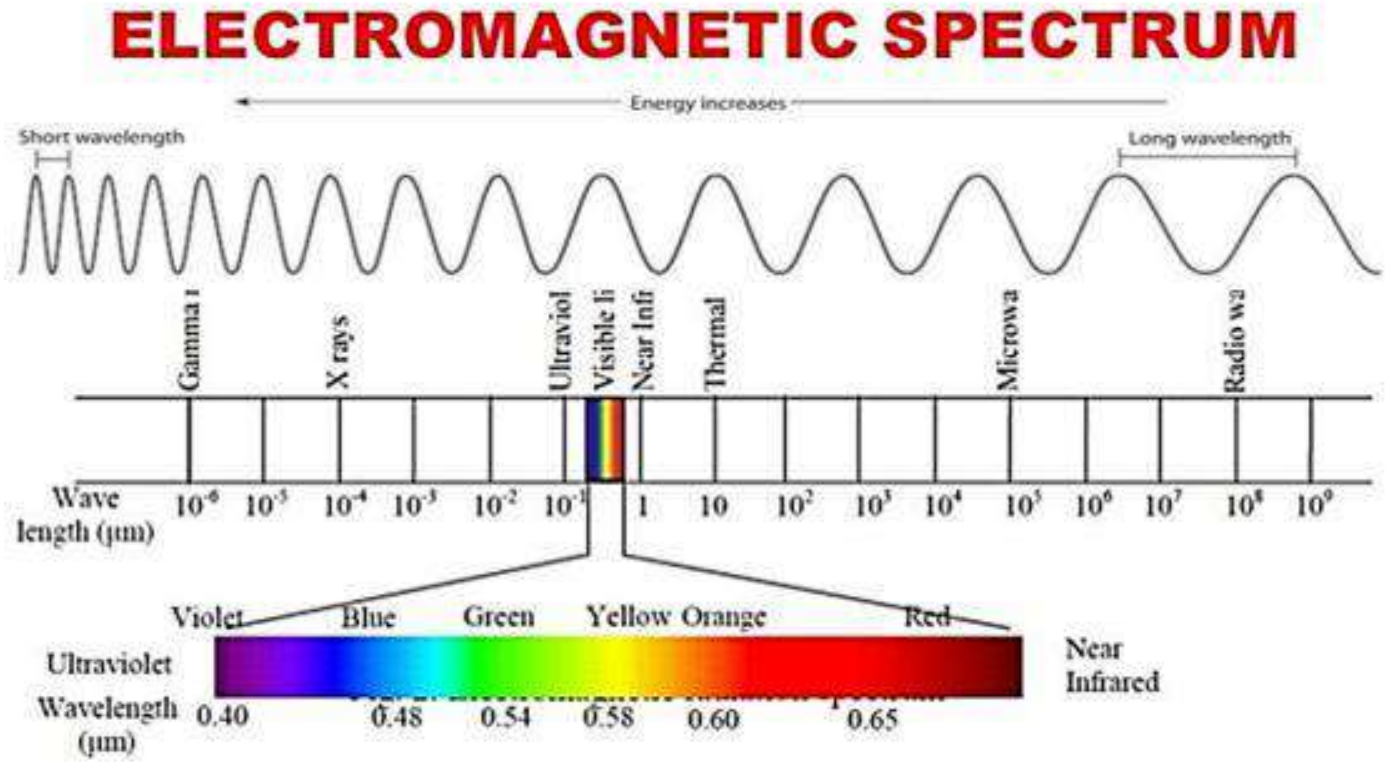
Thermal Technology in Surveillance Products

In order to understand Thermal Imaging, it is important to understand something about **light**

The amount of energy in a light wave is related to its wavelength: Shorter wavelengths have higher energy.

Of visible light, **violet** has the most energy, and **red** has the least. Just next to the visible light spectrum is the **infrared spectrum**.



- ✓ **The spectrum of visible light is actually only a small part of a large band of detectable signals, or waves, that travel through matter.**
- ✓ **The electromagnetic spectrum contains radiation from various invisible wave types, each with a unique wavelength.**
- ✓ **Thermal radiation is one of these, featuring longer wavelengths than those of visible light, and is therefore generally invisible to the human eye.**

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Thermal Technology in Surveillance Products

It's an effective form of night-vision technology, with the capability to work in the total absence of any light (since it doesn't rely on visible light), and can even work in smoke, fog, smog and haze.

- ✓ All objects emit infrared energy (heat) as a function of their temperature. The infrared energy emitted by an object is known as its heat signature.
- ✓ The higher an object's temperature, the more radiations are is emitted.
- ✓ A thermal imager (also known as a thermal camera) is essentially a heat sensor that is capable of detecting tiny differences in temperature.
- ✓ The device collects the infrared radiation from objects in the scene and creates an electronic image based on information about the temperature differences. Because objects are rarely precisely the same temperature as other objects around them, a thermal cameras make the invisible thermal radiation "visible" in the form of heat zone images.

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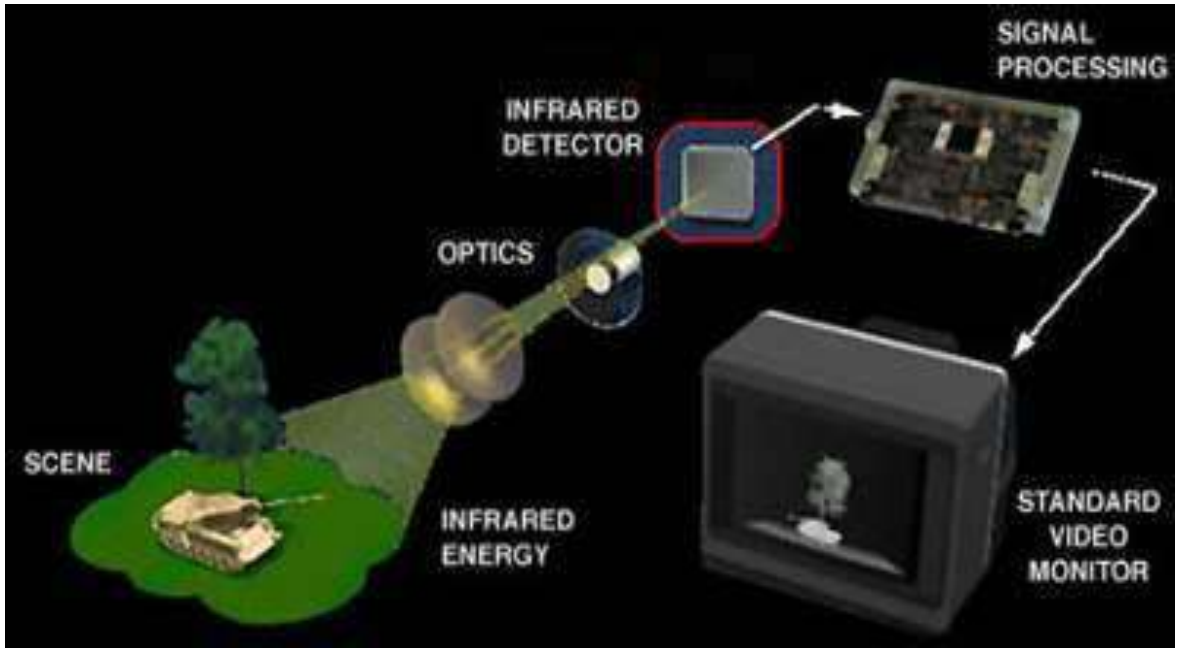
How Thermal technology works in Surveillance Products?

1. A special lens focuses the infrared light emitted by all of the objects in view.

2. The focused light is scanned by a phased array of infrared-detector elements. The detector elements create a very detailed temperature pattern called a **thermogram**. It only takes about one-thirtieth of a second for the detector array to obtain the temperature information to make the thermogram. The thermogram created by the detector elements is translated into electric impulses.

3. The impulses are sent to a signal-processing unit, a circuit board with a dedicated chip that translates the information from the elements into data for the display.

4. The signal-processing unit sends the information to the display



The basic components of a thermal-imaging system

Thermal images are normally grayscale in nature: black objects are cold, white objects are hot and the depth of gray indicates variations between the two.

However, newer models of thermal imaging cameras actually add color to the images they produce, in order to help users better identify distinct objects more clearly – using colors such as orange, blue, yellow, red and purple.

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Thermal Temperature Screening with "Artificial Intelligence (AI) Technology"

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Thermal Temperature Screening with AI Technology

With Time and Requirements “Thermal technology” is enhanced and upgraded with AI (Artificial Intelligent) Technology…..Latest we have “Thermal Temperature Screening with AI Technology”

Let’s First Understand “Artificial Intelligent” (AI)….

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What is AI Technology ?

Artificial Intelligence is the combination of two words – One is **Artificial** and seconds one is **Intelligence**.

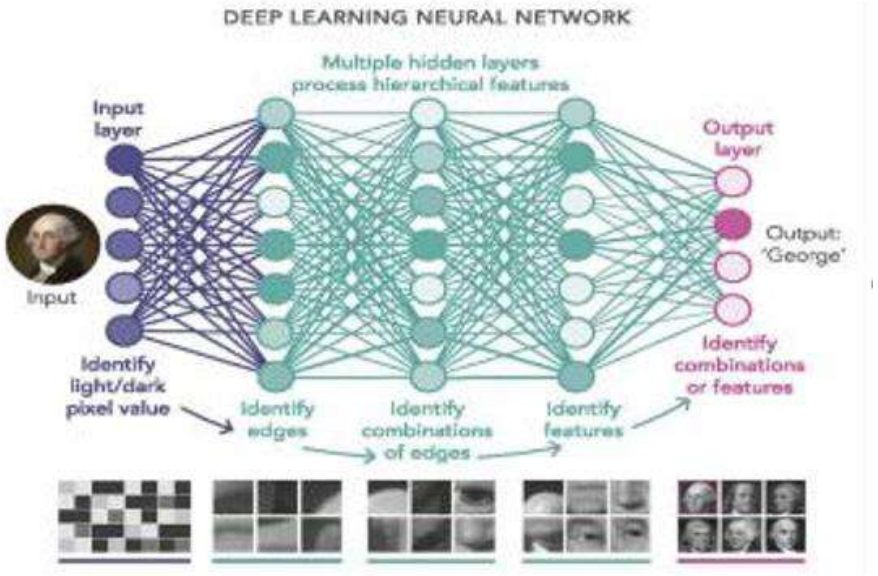
1. **Artificial** - non-natural or human made things.
2. **Intelligence** - Ability to understand, thinks and learns

Artificial Intelligence

When a machine is able to mimic human intelligence by having the ability to predict, classify, learn, plan, reason and/or percieve.

Deep Learning AI Technology

It is a technique to achieve Artificial Intelligence. But it uses Artificial Neural Network to solve the problem and predict the solution.



- ✓ Under the deep learning, essentially the machine is 'trained' using large amounts of data and algorithms to give it the ability to learn how to perform the task.
- ✓ This data is fed through neural networks which ask a series of binary true/false questions or numerical values, of every bit of data which pass through them, and classify it according to the answers received.

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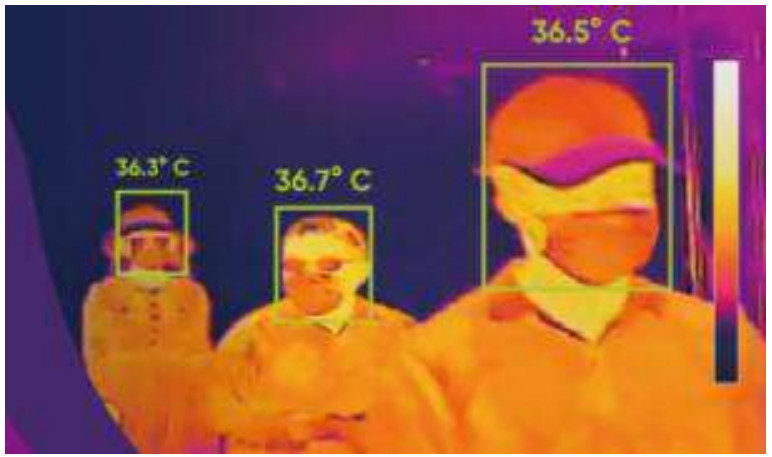
Thermal Temperature Screening with AI Technology

Thermal Temperature Screening Technology

Artificial Intelligent (AI) Technology

- ✓ **AI technology** ensures thermographic device only detect human skin-surface temperature to reduce false alarms of other heat sources.
- ✓ **Compensation algorithm** ensures the temperature is compensated with ambient temperature and the distance of the measured target for better accuracy.
- ✓ **Thermal technology** has been applied widely in temperature screening scenarios as it offers more flexibility and efficiency in preliminary screening of elevated skin-surface temperatures.



Temperature Screening with AI is designed for the detection of skin-surface temperatures so as to achieve rapid and safe preliminary screening in public areas with high efficiency in a multitude of scenarios.

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What is Need of "Surveillance Solution in Hospital Industry"

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Why and Where do we need Thermal temperature screening with AI surveillance solution in Hospitals ?

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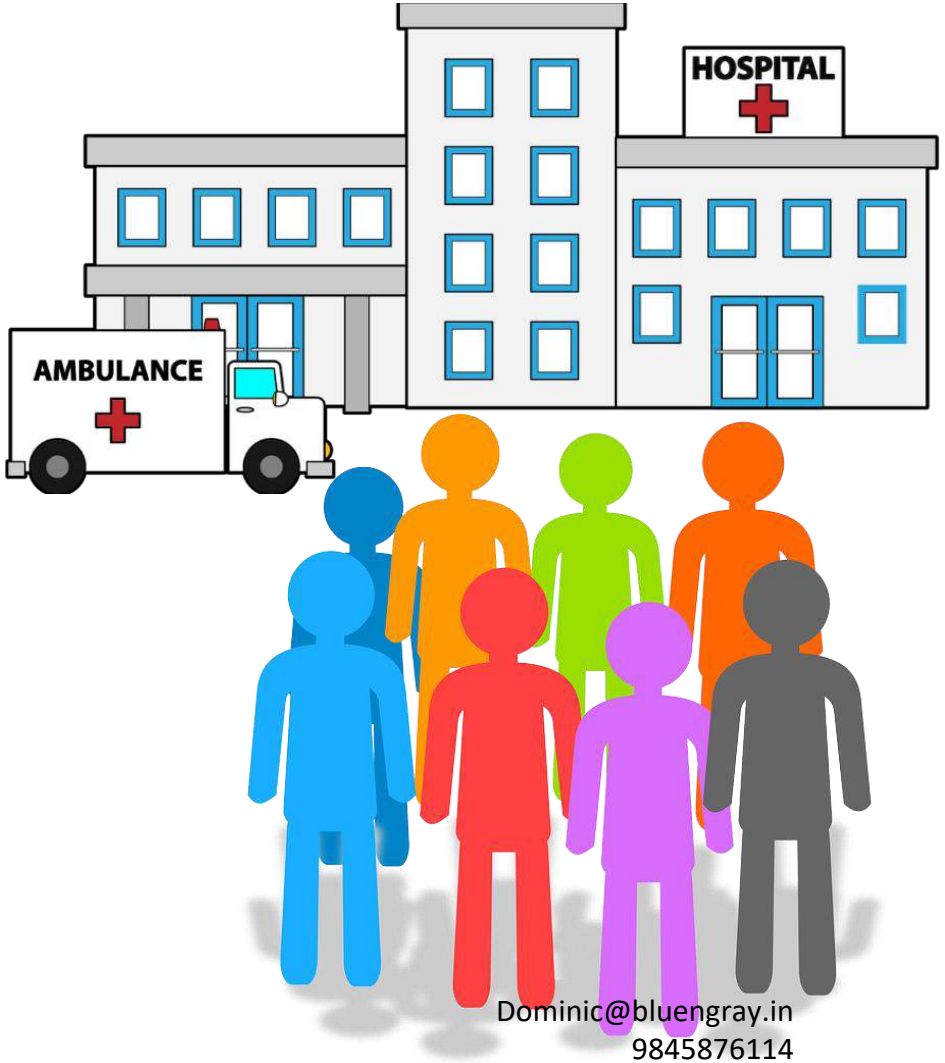
Everyone know …..The world is experiencing a global viral epidemic named Novel Corona Virus / Covid-19.

- ✓ As there are no remedy / antidote available for this Covid-19 virus, prevention is only the utmost solution.
- ✓ As country is going through lockdown phase, in response to the global COVID-19 pandemic caused by the coronavirus to prevent transmission of the virus…….But there are Few Vital, Emergency Industry which can't be Lockdown and One of them is Hospital Industry

Hospital's sees large number of people, healthy or ill, going in and out everyday.



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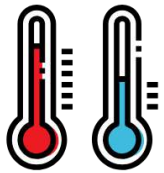
Entrance is one of the most crucial places in the hospital as everyone need to pass through.



Screening people with abnormal temperature through a thermometer, or people without masks through the human eye, these traditional methods perform well. However, all of these methods have obvious and significant deficiencies:

Current Challenges in Hospital's

Close Contact, High Risk

- Close contact among Hospital Exist and Coming Patients, Doctors and Working Staff, leading to high risk of infection.

High Cost, Low Efficiency

- Lots of manpower invested.
- Person-by-person inspection is inefficient.

Difficult to Collect Statistics

- Manual registration is required, which may lead to human error and not so timely feedback.

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Application & Solution Scenarios for "Hospital Entrance Area"

Part A – Human Entrance

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Thermal Temperature Screening Technology

Artificial Intelligent (AI) Technology

Different Solution for Human Entrance

01 Entrance with Temperature Screening & Security Surveillance

02 Entrance with Wireless Temperature Screening

03 Entrance With Temperature Screening metal detector door & Thermographic Surveillance device

04 Entrance of Hospital Transport (like Bus , Mini Bus) used for Staff with Temperature screening device

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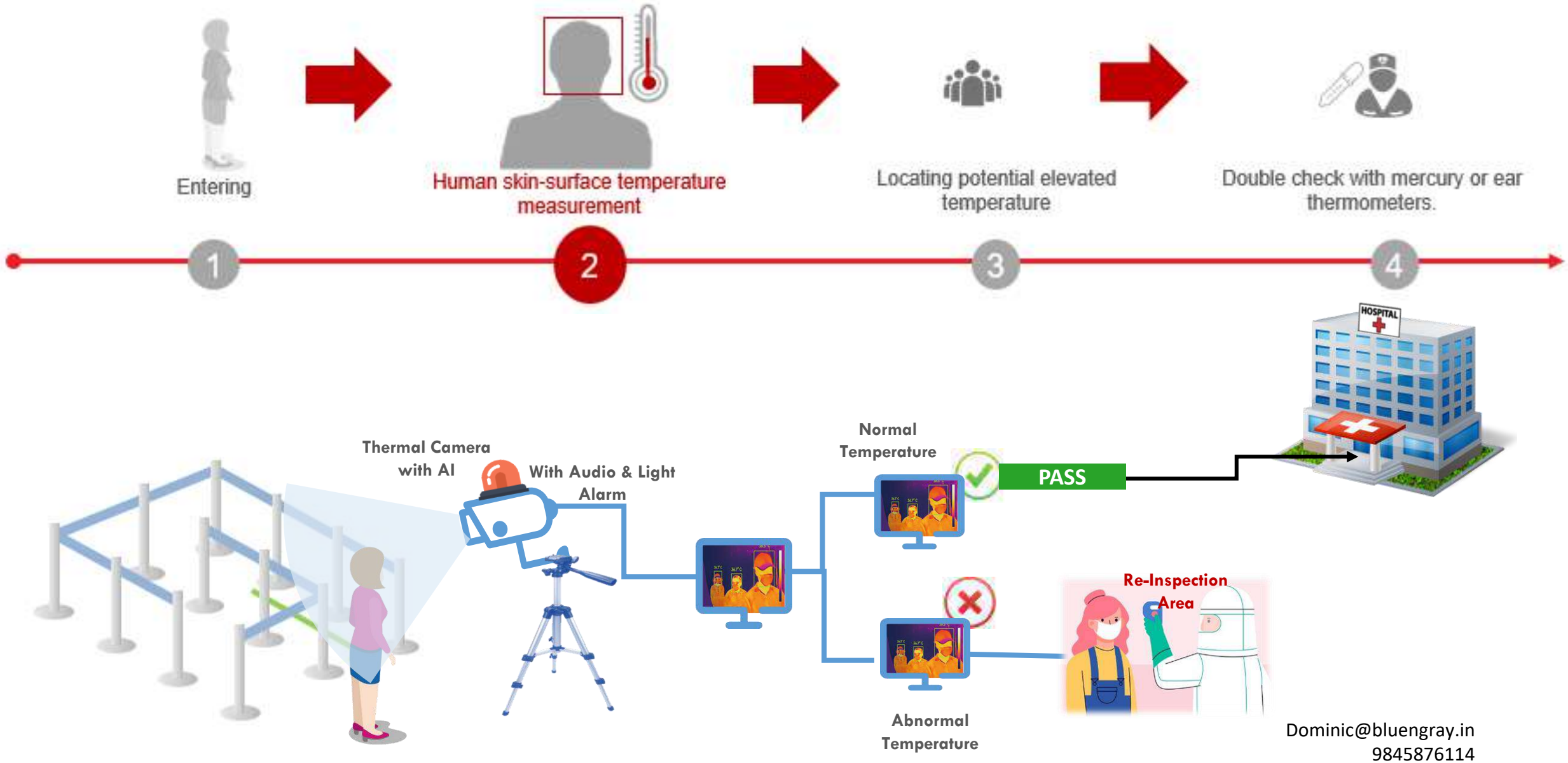
01 Entrance with Temperature Screening & Security Surveillance - Option A



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01 Entrance with Temperature Screening & Security Surveillance - Option B

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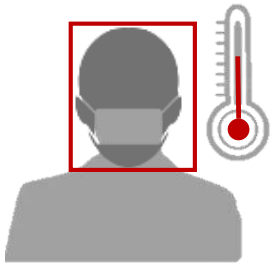
Entering

1



Human skin-surface temperature measurement with Mask detection

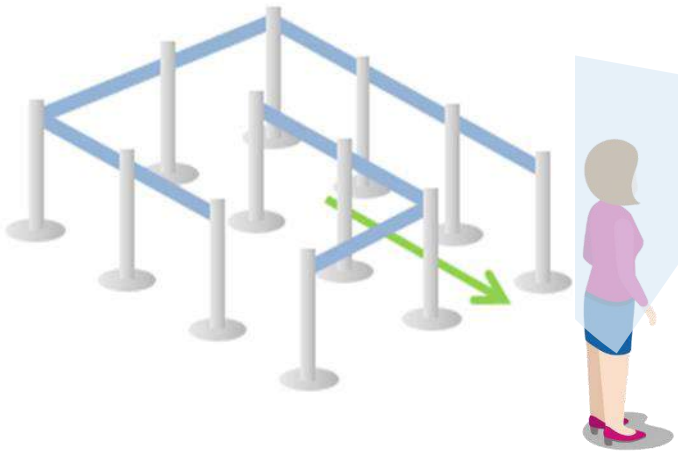
2

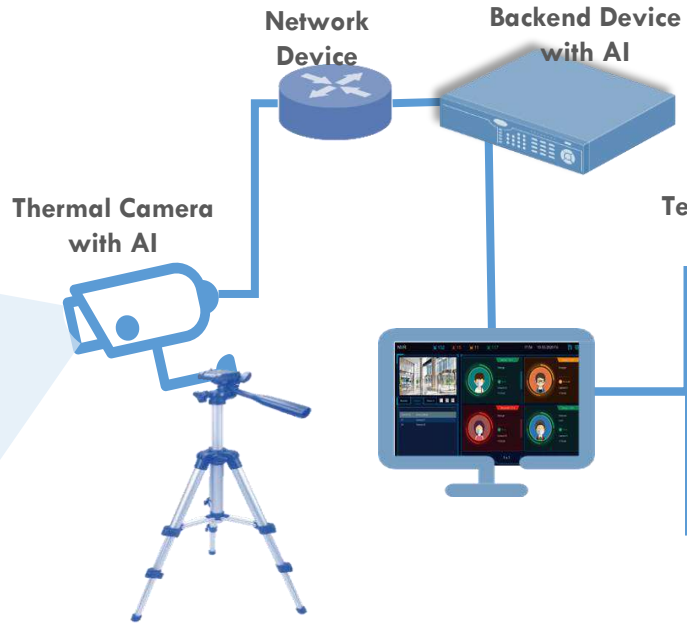
Locating potential elevated temperature, people without masks

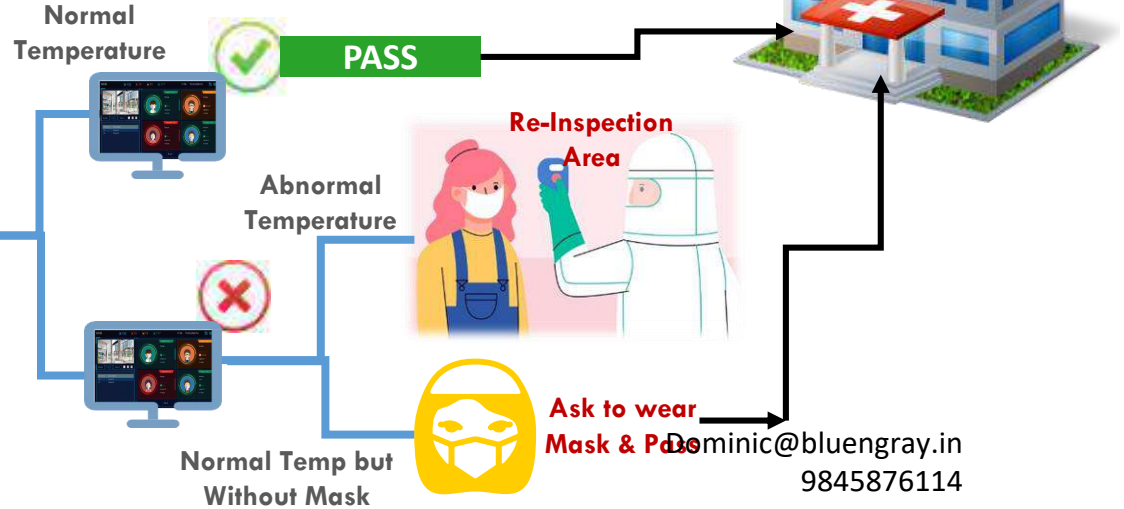
3

Double check with mercury or ear thermometers, Remind people to wear masks

4







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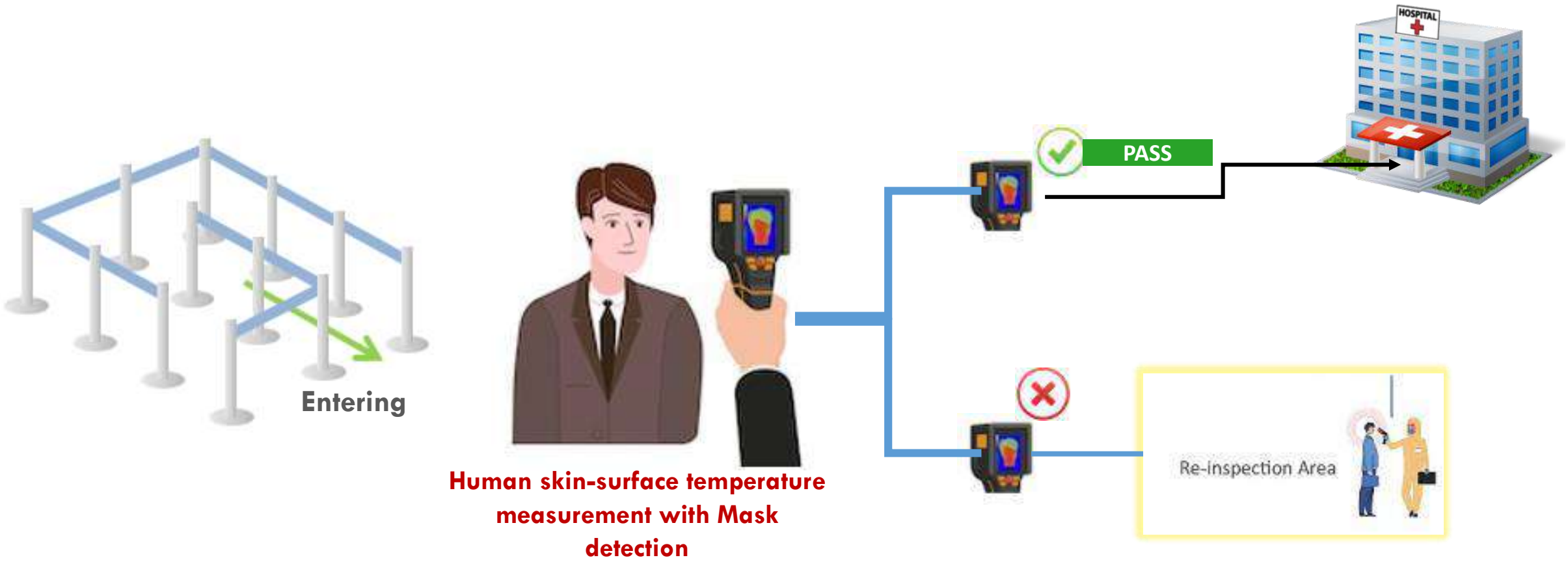
02 Entrance with Wireless Temperature Screening

Hand-held thermographic camera can be used at the entrance to do temporary temperature screening with another line if there are too many people waiting.



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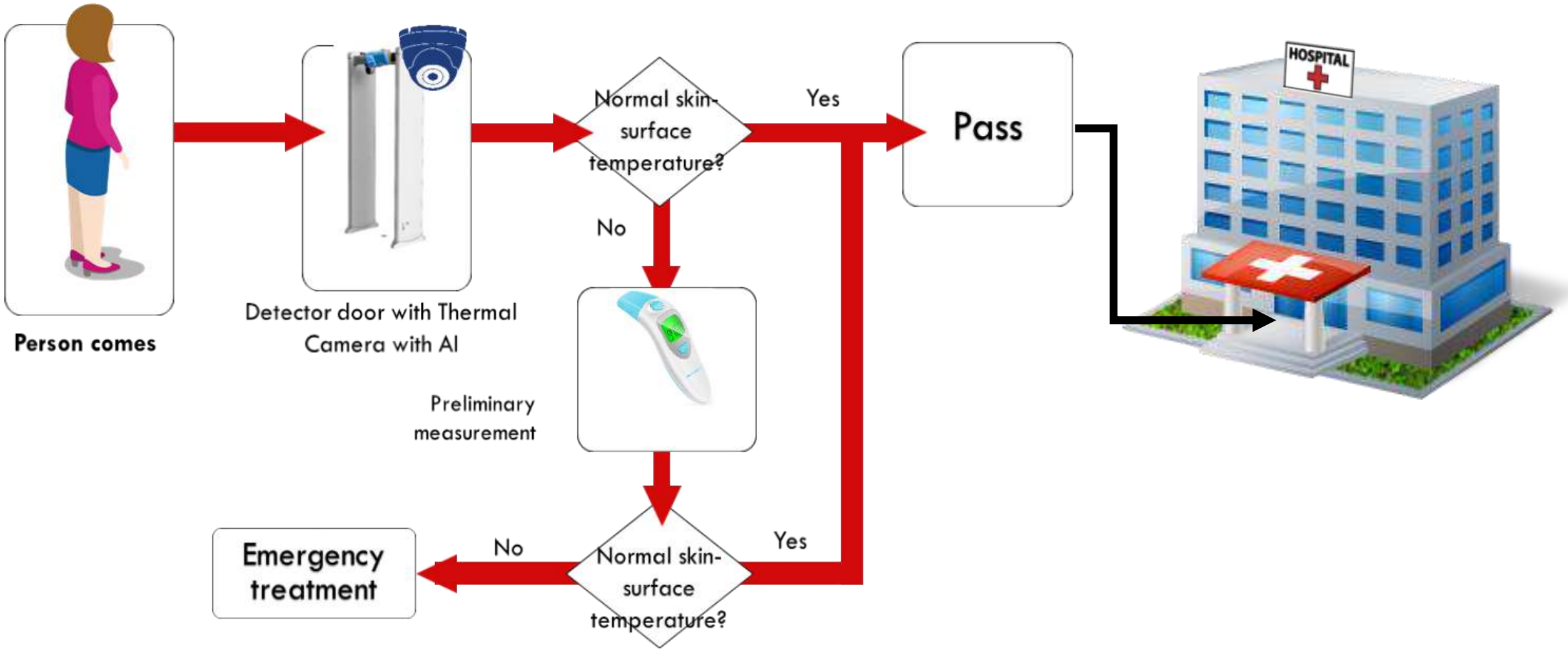
03 Entrance With Temperature Screening metal detector door & Thermographic Surveillance device



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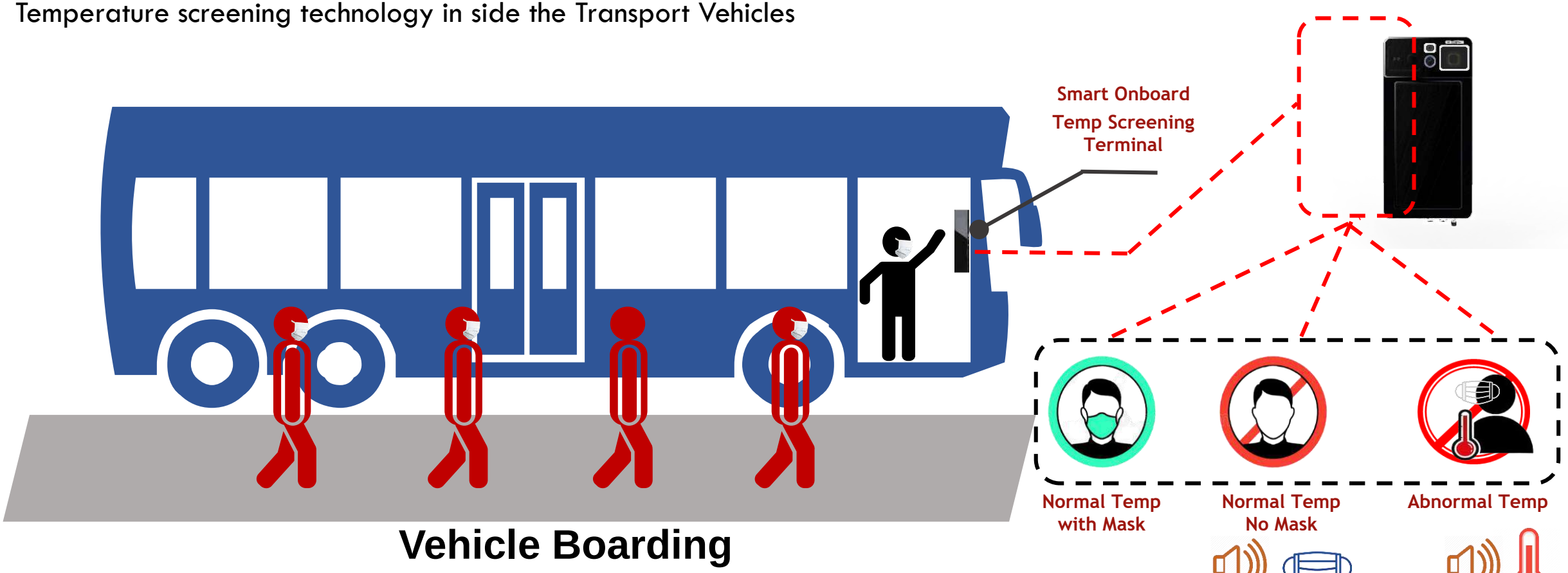
04 Entrance of Hospital Transport (like Bus , Mini Bus) used for Staff with Temper screening device

Some Hospital Provide Transport for their staff in current COVID-19 situation … So to ensure the travel is safe for staff and make it convenient …We can install Special Terminals with Temperature screening technology in side the Transport Vehicles



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Application & Solution Scenarios for "Hospital Entrance Area"

Part B – Vehicle Entrance

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Vehicle Entrance

Based on

Surveillance with Artificial Intelligent (AI) Technology

Different Solution for Vehicle Entrance

01 Hospital's Parking Entrance with AI based ANPR (Automatic Number Plate Recognition) Surveillance Solution

02 Hospital's Parking Entrance with Under Vehicle Surveillance System (UVSS) & ANPR Surveillance Solution

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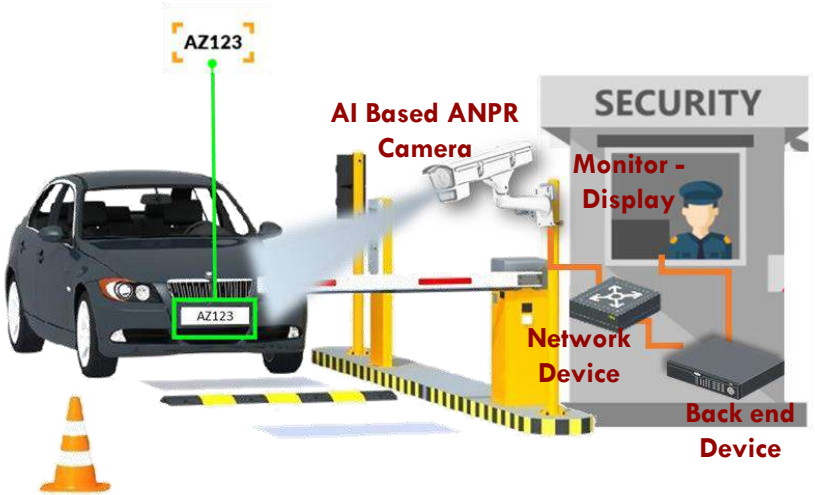
01 Hospital's Parking Entrance with AI based ANPR (Automatic Number Plate Recognition) Surveillance Solution

- ✓ AI based ANPR Surveillance can recognize whether it's a car or not first, then to read the license plate.
- ✓ It can recognize the no-plate vehicle detection (**So any illegal Entry in Hospital can be detected**)



Deep learning AI Technology filtered unnecessary detection and Help to Reduce false capture rate

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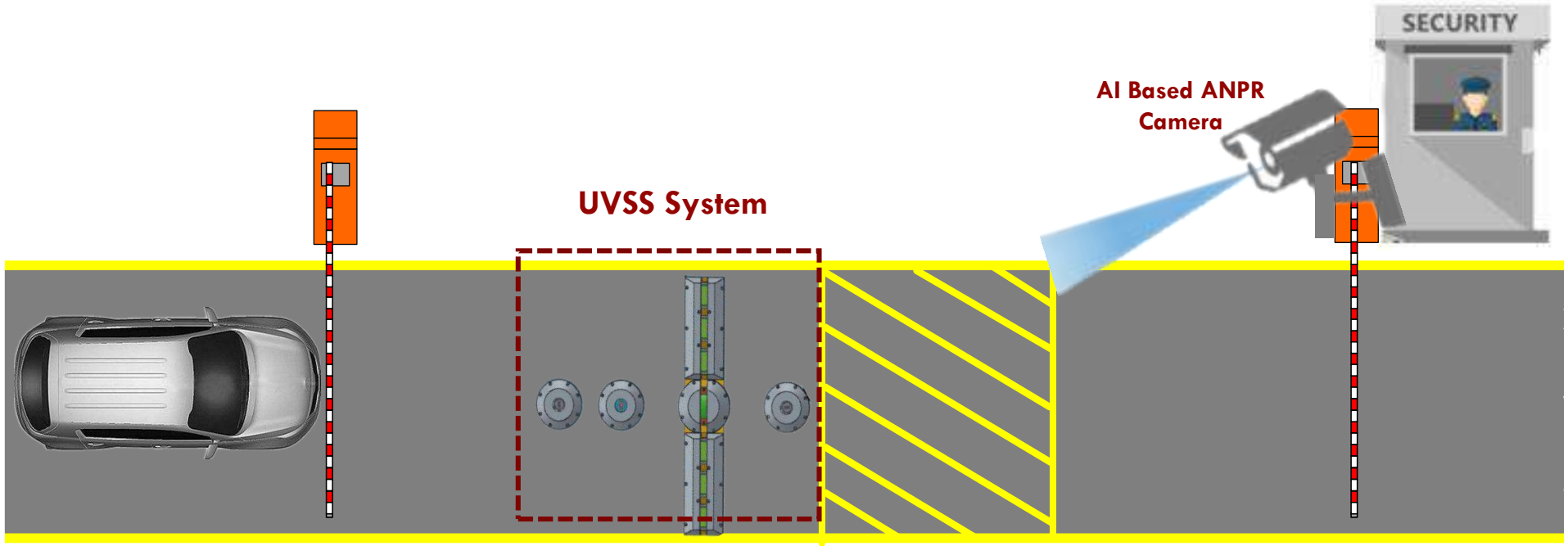
02 Hospital's Parking Entrance with Under Vehicle Surveillance System (UVSS) & ANPR Surveillance Solution

✓ To Be More Precise at Entrance & Exit – With AI based ANPR Camera we can have UVSS Surveillance Solution ….Which help to prevent Hospitals with high risk of any dangerous activity ….In Some cases its hidden under the Vehicle and can enter inside premises



1. Automatically detects vehicle undercarriages
2. Synchronizes ANPR/LPR camera data with under-vehicle images
3. Suits various vehicle models, with entire vehicle chassis in one picture

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Application & Solution Scenarios for "Hospital's Inside Area"

Part A – Isolation Ward

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Challenges inside Area of Hospital's

Apart from Entrance area of Hospital's ….We know healthcare professionals which are Our Fore front worries in this epidemic……In Higher Risk…. As they are in contact with the infected patients all the time

1. Coming in contact with potential patients who come for diagnosis and testing
2. Communicating with infected patients who are quarantined
3. Keeping a tab on large number of patients by going on multiple rounds of the medical premises.
4. Coming in contact with other colleagues like nurses etc. who are also exposed to patients

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We have IoT & Cloud based Surveillance Solution for Different and Important area of Hospital's….Specially Isolation wards

Surveillance Solution for Isolation Wards –

01 Doctor's & Patient Communication without Close Contact (Isolation Ward Monitoring)

OR

01 Patient's & Their Family Communication without Close Contact (Isolation Ward Monitoring)

02 Emergency Alarm Monitoring for Quarantine or Isolated Patients

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01 Doctor's & Patient Communication without Coming in Close Contact (Isolation - Ward Monitoring)

Monitor patients remotely from laptop/ Mobile App without meeting them physically at your own convenient time

Wireless Surveillance Camera with Built in Mic/Speaker

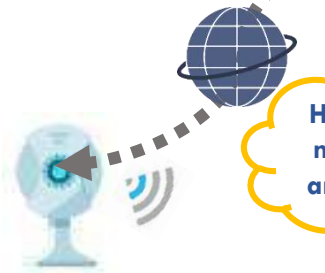
assign resource or Staff to patient in accordance to need

or

This solution we can applied to any Ward ….like Emergency / ICU / Special…etc.

OR

Using Cloud Technology Through wireless Surveillance….Isolated or Quarantine Patient's can communicate with their family member



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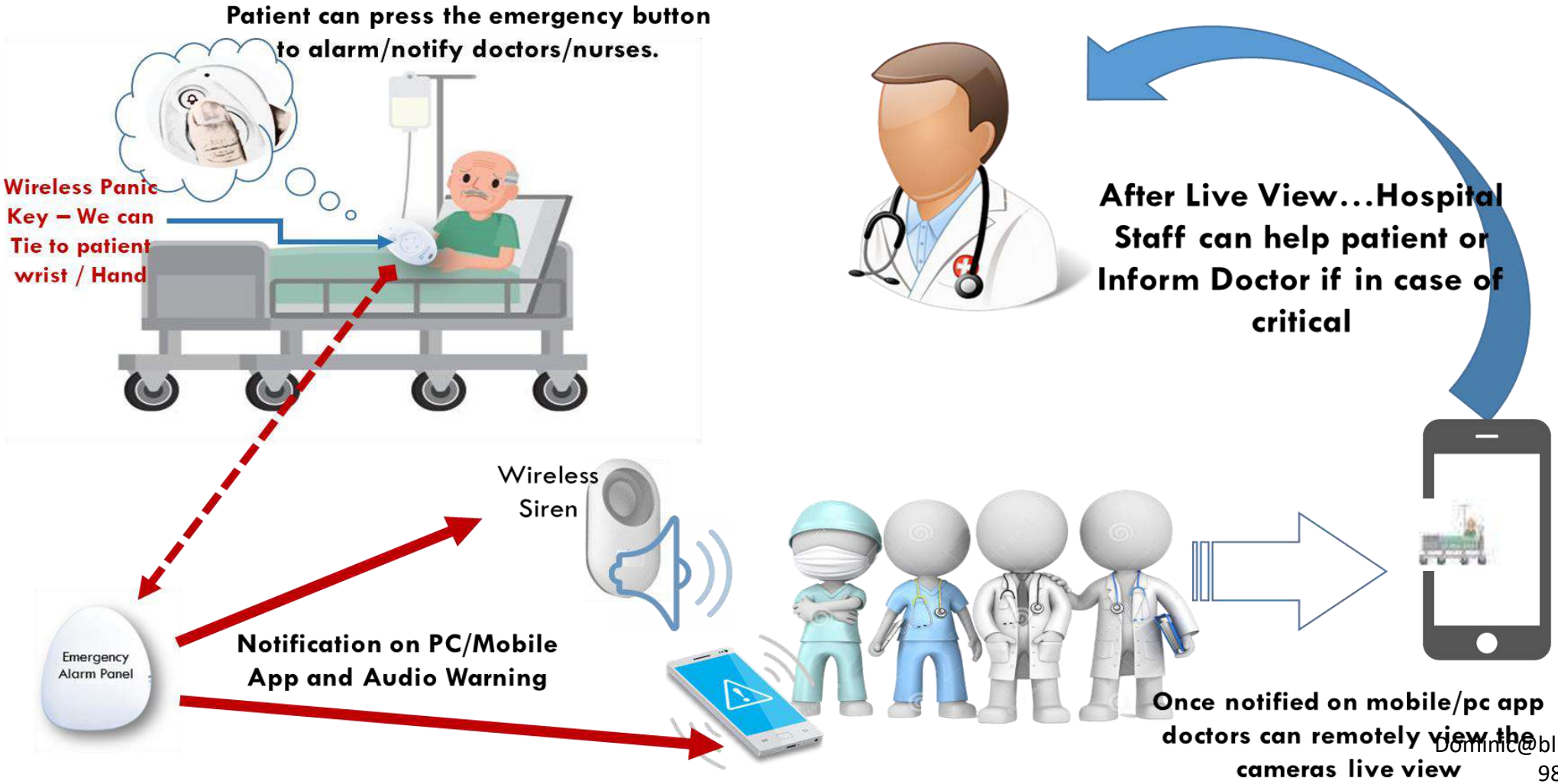
02 Emergency Alarm Monitoring for Quarantine or Isolated Patients

Emergency Alarm raise by Patient's for Essentials (like health / Food / Water) can be attend by Hospital Staff & Doctor by remotely without coming in contact….Can Contact if found Critical



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Application & Solution Scenarios for "Hospital's Inside Area"

Part B – Operation Theaters / Other Authorized Area

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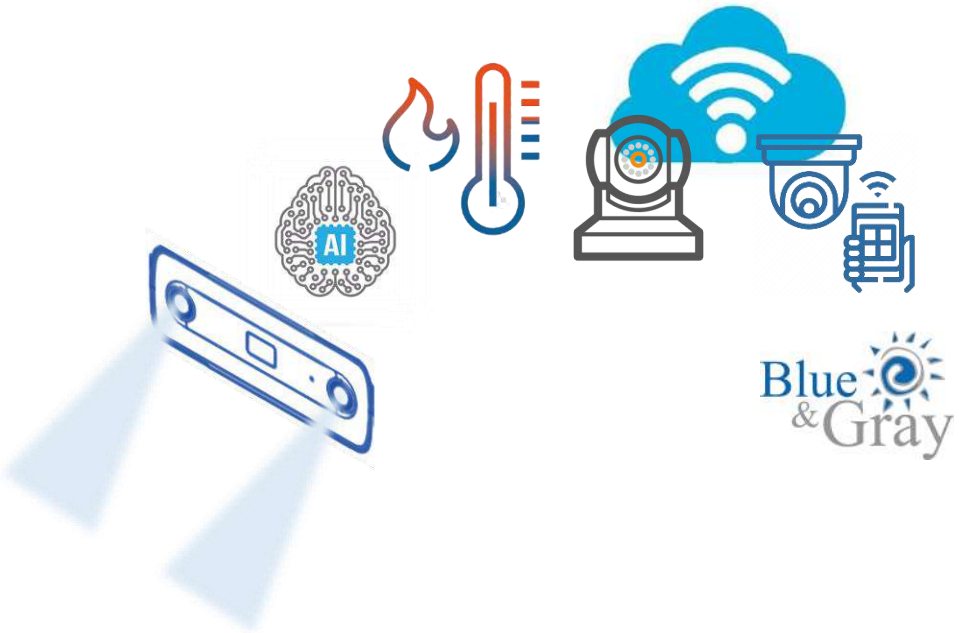
Surveillance Solution for Operation Theater or Other Authorized Area of Hospital's

Using different Technologies like … Binocular Stereo Vision, AI, Thermal, and IoT & Cloud based



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Different Applications & Solutions -

01 Face Access Terminal for Hospital's Authorized Staff at Restricted location with Temperature Screening

02 Application for Maintain Social distancing in Patients waiting area , Hospital pharmacy

03 Live View of Surgery with Wireless Surveillance

04 Online Operation or Surgery Monitoring for Intern Medical Student

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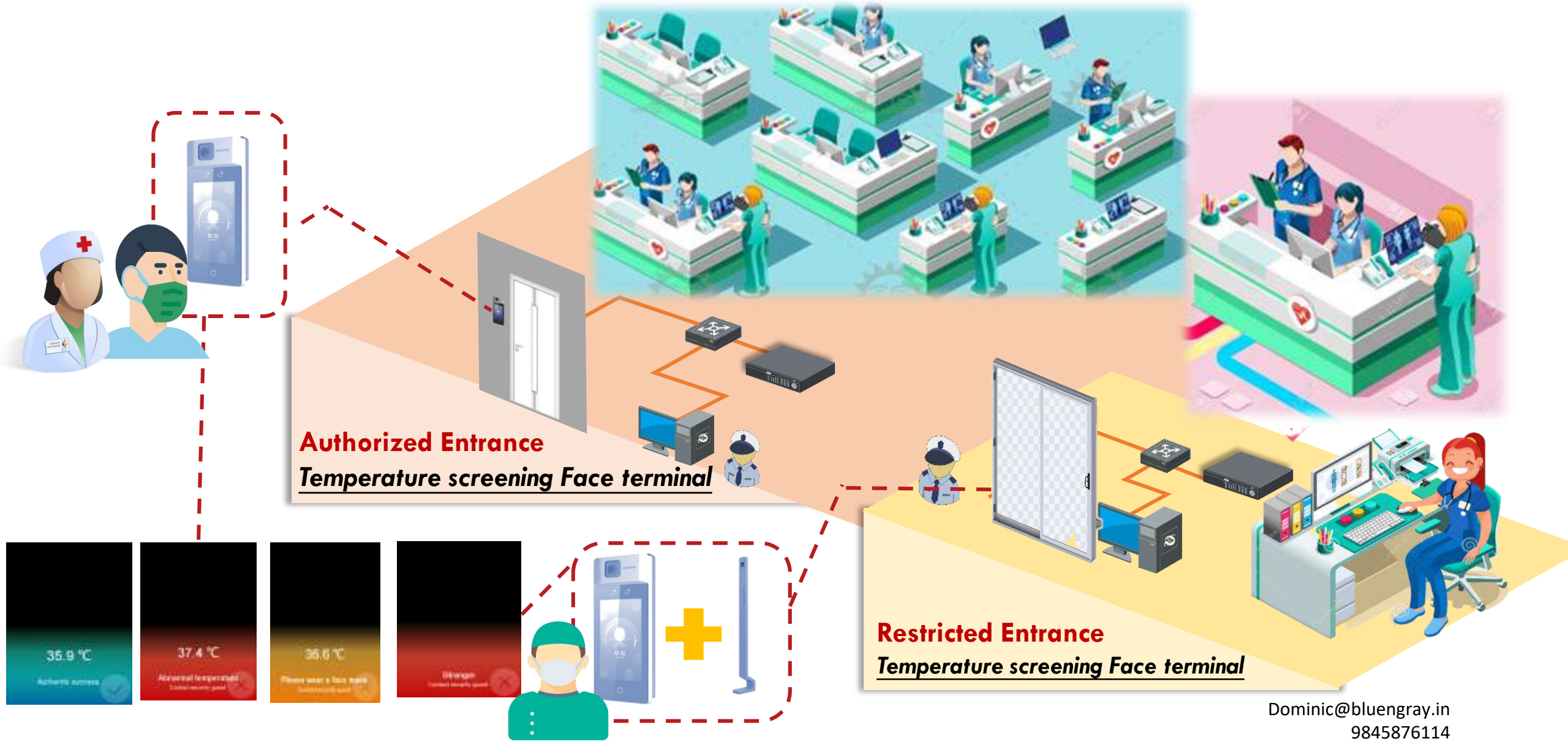
01 Face Access & Attendance Terminal for Hospital's Authorized Staff at Restricted location with Temperature Screening



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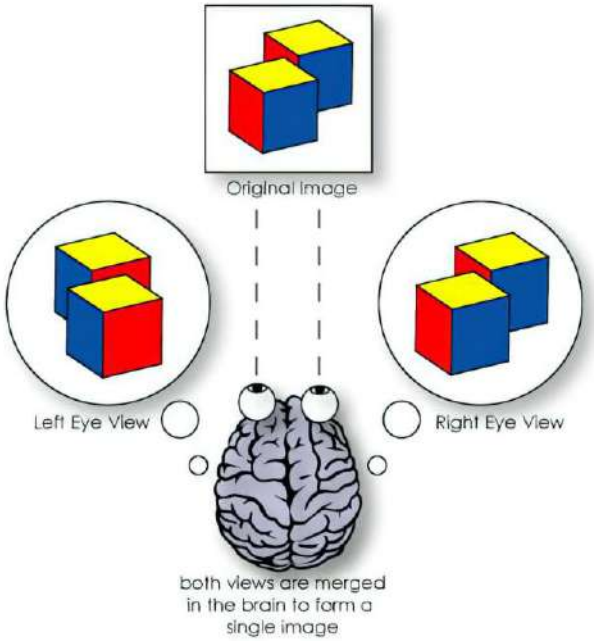
02 Application for Maintain Social distancing in Patients waiting area , Hospital pharmacy

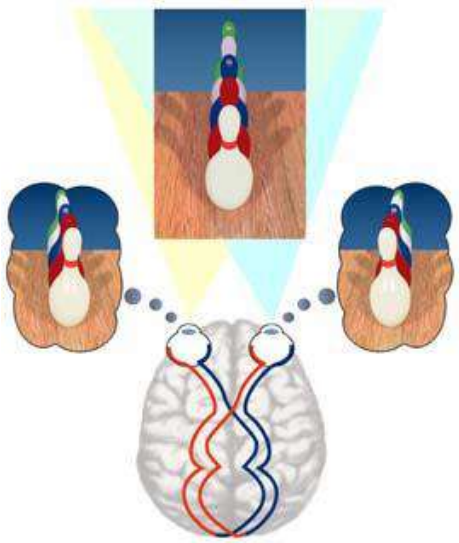
In this application scenario, We can use combination of 2 Technology as Solution

1. Binocular Stereo Vision Technology
2. Deep learning Artificial Intelligence Technology

"**Binocular stereo vision technology**" is based on processing two images. It directly simulates the manner of human eyes observing one scene from two different viewpoints.



The advantage of much greater depth perception, or the ability to distinguish the distance of an object. Binocular vision also allows for stereopsis, or the ability to view the world in three dimensions.



A **stereo vision surveillance device** is a type of camera with two or more lenses with a separate image sensor for each lens. This allows the camera to simulate human binocular vision, and therefore gives it the ability to capture three-dimensional images.

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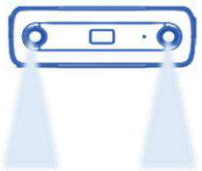


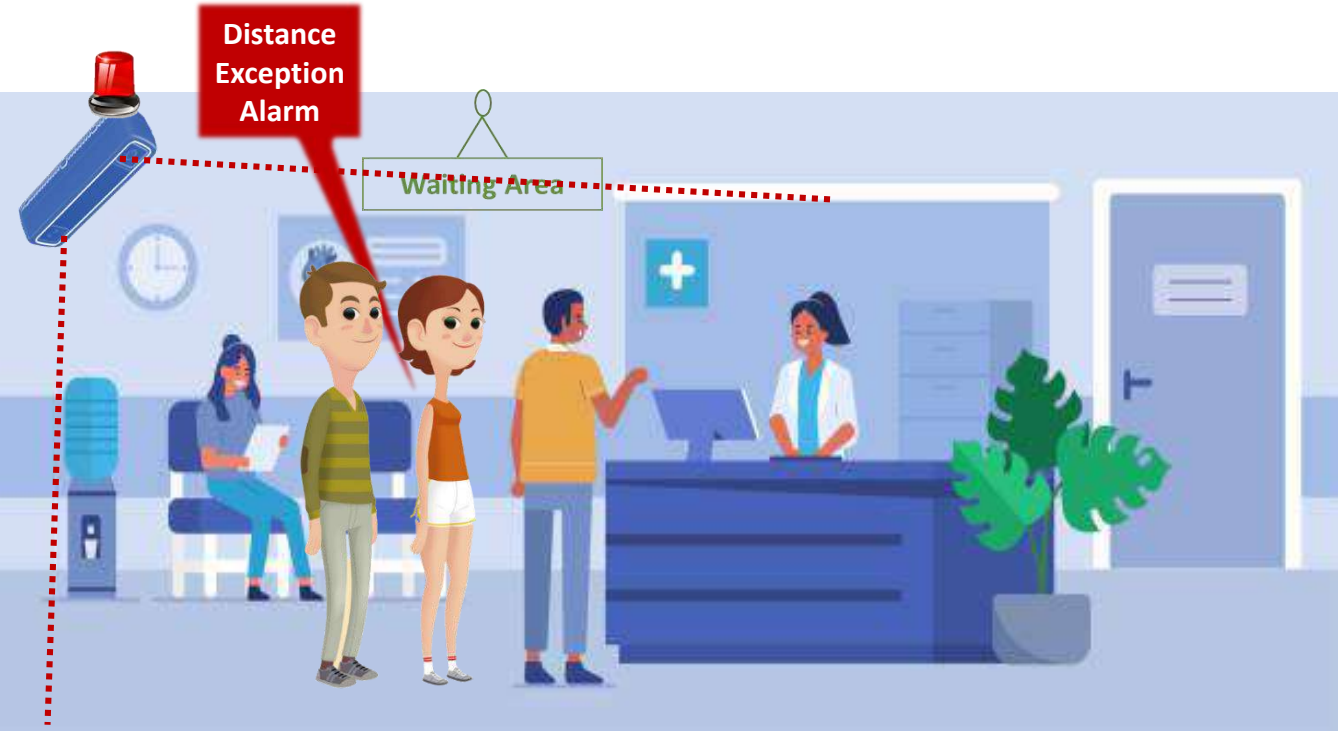
“Binocular stereo vision technology” + “Artificial Intelligence Technology”

Binocular stereo vision Technology helps to get the 3D geometric information of the objects and to distinguish the distance of an object.

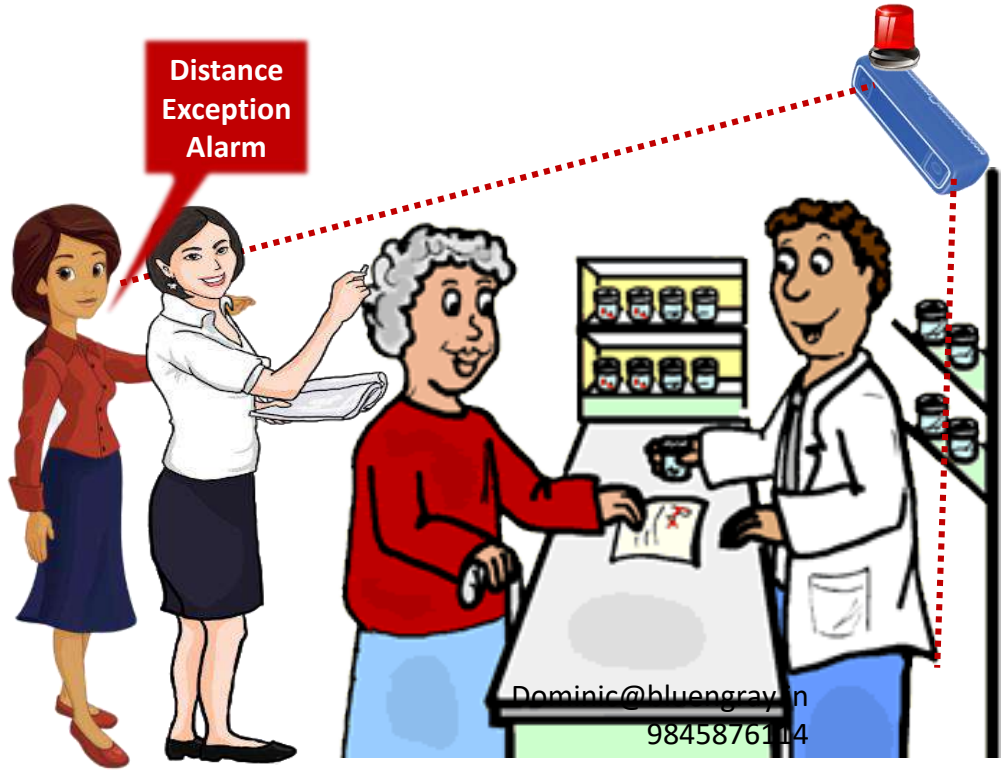
AI Technology ensures Human detection only to reduce false alarm due to other object detection.

Upgraded Algorithm allow users to configure duration and distance threshold so that alarm can triggered at particular point of time.

Solutions – At Patients Waiting Area



Solutions – At Hospital Pharmacy



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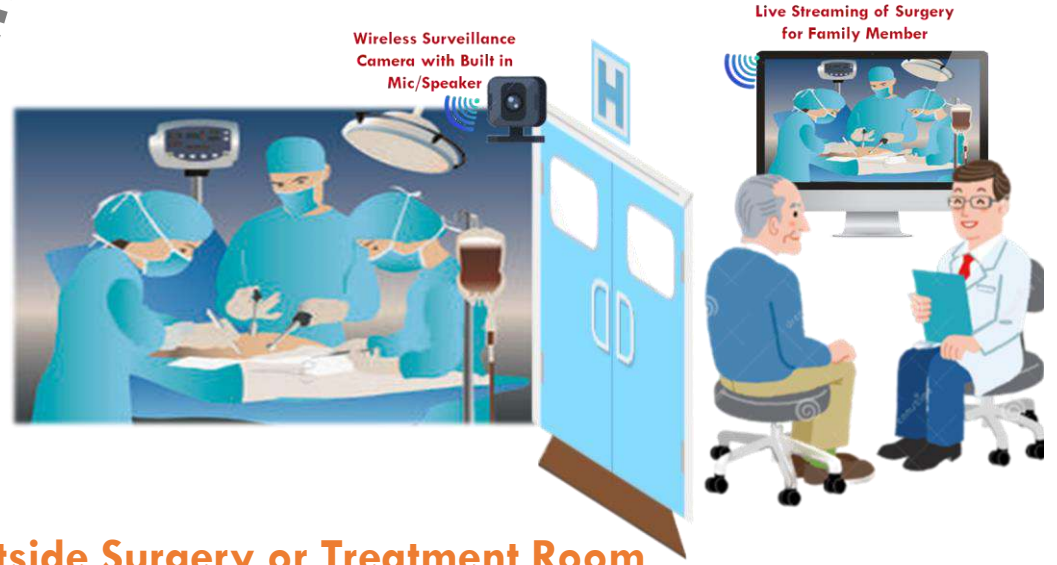
03 Live Streaming of Surgery with Wireless Surveillance

Through Wireless Surveillance and Cloud Technology we can use Surveillance for Live Streaming……..

Live Streaming can be use for Consulting with Other Faculty Doctors not in same location….For Some Important case



Outside Surgery or Treatment Room for Family Members can have Live streaming of Treatment

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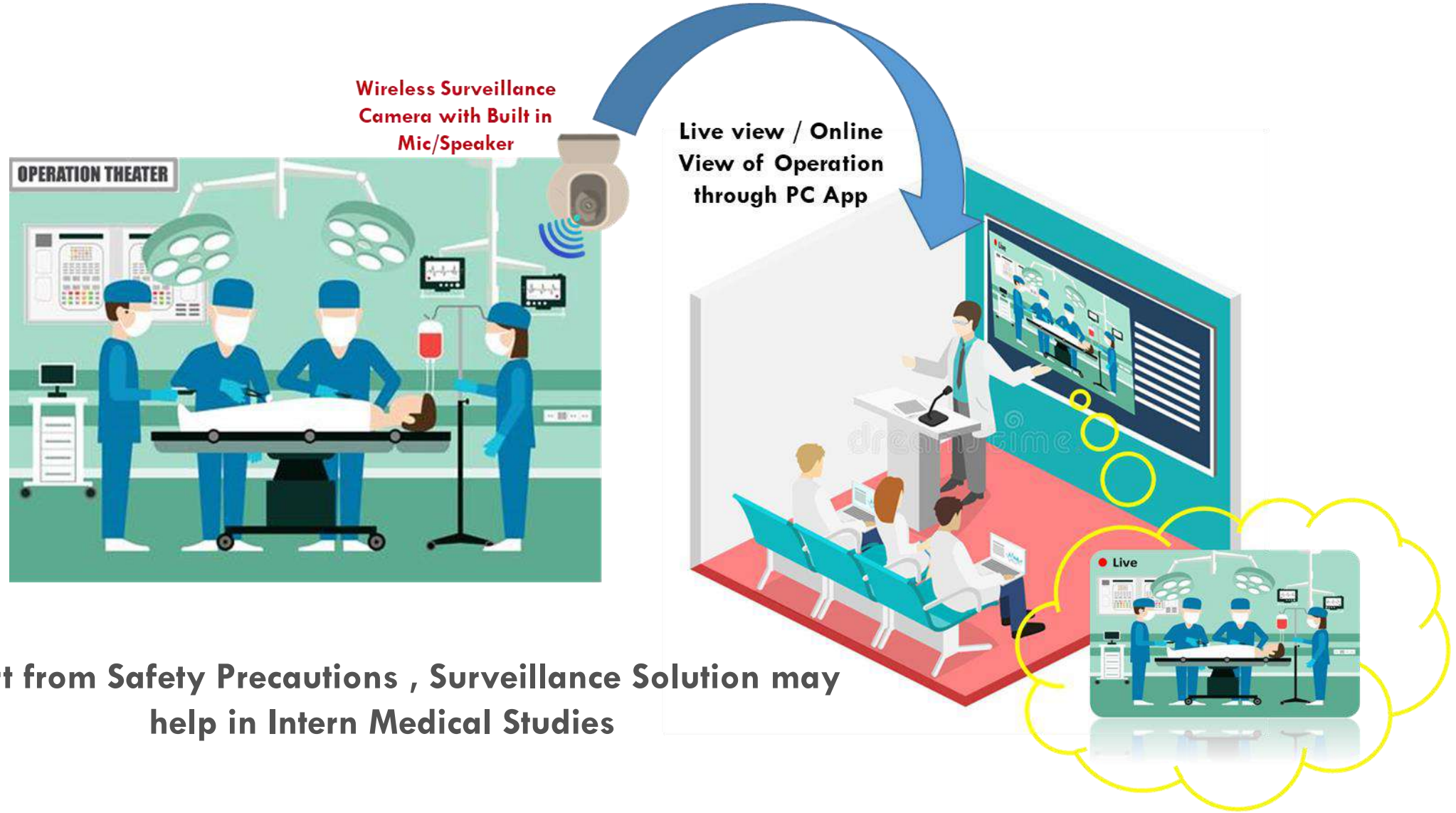
04 Online Operation or Surgery Monitoring for Intern Medical Student



Apart from Safety Precautions , Surveillance Solution may help in Intern Medical Studies

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Benefits of
Surveillance solution in Hospital's

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Safety

- ✓ Non-contact method
- ✓ Prevent a secondary infection
- ✓ Detect suspected people with Elevated Skin Temperature
- ✓ Protect important Areas of Hospital's to be Infected

Efficiency

- ✓ Reduce measurement time
- ✓ Reduce monitoring manpower
- ✓ Simultaneous monitoring is available

Convenience

- ✓ Simple installation
- ✓ Simple monitoring
- ✓ Automatic warning alert

Peace of mind

- ✓ Come back to our daily work
- ✓ Trust one another
- ✓ After COVID-19, we still need this system

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